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(54) A FILTER

(71) We, PUROLATOR FILTER G.m.b.H., of 45 Schleifbachweg, D-711 Oehringen, Germany, a German body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a filter, more particularly an oil filter for hydraulic installations, having an annular filter element accommodated within a cup-shaped housing having an annular cover sealed thereto, the central opening in the cover being for outlet of the filtrate and other openings in the cover being provided for inlet of the liquid to be filtered into an annular space between the filter element and the housing wall. A non-return valve arrangement is provided in association with the inlet openings, while bypass openings with another non-return valve arrangement, operating at a higher liquid pressure than that associated with the inlet openings, provide a bypass for the filter element should the latter become choked.

According to the present invention there is provided an oil filter for an hydraulic installation, including: a cup-shaped housing; an annular filter element contained within the housing; a cylindrical sleeve mounted on the end of the filter element adjacent the open end of the housing and projecting axially towards the open end; an elastically deformable annular valve member of V-shaped cross-section whose shanks provide a pair of annular lip seals, the interior surface of the apex of the V seating on the projecting end of the cylindrical sleeve; and an annular cover sealed to the open end of the housing and having a central filtrate outlet opening and a ring groove receiving the apex of the V-section of the valve member; wherein the cover is provided with openings for the inlet of liquid to be filtered into an annular space between the filter element and the housing wall, the said sleeve is provided with at least one bypass opening affording communication between the inlet and outlet openings of the filter for bypassing the filter element; and wherein the apex of the V-section of the valve member is clamped between the said cylindrical sleeve and the ring groove, and the shanks of the valve member are urged by their elastic stress to press against the cover and the cylindrical sleeve, respectively, to close the inlet and bypass openings, the closing pressure exerted by the shank against the cylindrical sleeve being greater than that exerted by the other shank against the cover.

Fig. 1 is a cross-section through a filter in accordance with the invention, in the inoperative position with non-return and bypass valves closed;

Fig. 2 shows an upper portion of Fig. 1 during normal operation, thus with the non-return valve open, and

Fig. 3 shows the upper portion of Fig. 1 during excess pressure operation, with the non-return and bypass valves open.

The numeral 1 in the drawing denotes a cup-shaped housing which is closed by an annular cover 2 sealed thereto. Within the housing an annular filter element 3 is accommodated which is clamped between the cover 2 and a base 4 with interposition of a sealing ring 5 and an elastically deformable annular valve member 6. The filter element 3 consists of an annular star 7 of filter paper, which internally is supported by a sieve sleeve 8 and is supported and sealed at both end faces by supporting rings 9 and 24. The inner edge of the support ring 9 is bent up towards the cover 2 into an annular sleeve 10 which has a plurality of apertures formed therein and spaced around its circumference one of which, an aperture 11, is shown in the drawing. The control aperture 12 of the cover 2 provides an outlet opening for the purified filtrate, from a filter chamber 13— i.e. the interior space enclosed by the filter element 3.

The cover 2 has a frustoconical portion pierced by a ring of inlet openings, one of which, an inlet opening 14, is shown in the drawing. The inlet opening 14 leads into an annular space 15 between a side wall 16 of the cup 1 and the filter element 3. The

valve member 6 has a V-shaped cross-section, its apex 17 fitting into a ring groove 18 formed by the junction of the frustoconical portion with an inwardly turned cylindrical skirt portion which surrounds the outlet opening 12 at the smaller diameter of the frustoconical portion and is coaxial therewith. The valve member, when the filter is assembled, is clamped in the ring groove 18 by the upper edge 19 of the sleeve 10, which projects into the inside of the apex 17. The outer shank 20 of the valve member 6 is under stress caused by the resilience of the ring, which may be made of rubber or rubber-like plastics material, and presses against the frustoconical portion of the cover 2 and covers the inlet opening 14. The inner shank 21 of valve member 6 similarly presses against the sleeve 10 and covers the aperture 11, the closing pressure exerted by the shank 21 being greater than that of the outer shank 20. The shank 20 is a sealing ring lip of a non-return valve, and the shank 21 a sealing lip of a bypass valve.

All parts of the filter shown are formed substantially cylindrically symmetrical relative to the axis of symmetry 23. The functions of the two valves are illustrated in Figs. 2 and 3, in which arrows are shown, which indicate the flow of a filterable medium. In the inoperative position the valve member 6, with its two shanks 20 and 21, as shown in Fig. 1, presses against the cover 2 and the sleeve 10, respectively, and closes both the opening 14 and the aperture 11.

During normal operation the operating pressure of the liquid being filtered overcomes the elastic stress of the outer shank 20 and depresses the latter, which operates as a non-return valve. The inner shank 21, which is stressed more strongly, is not deformed by the normal operating pressure, so that the overflow valve remains closed.

If a predetermined operating pressure is exceeded, then the inner shank 21 yields as shown in Fig. 3, and exposes the aperture 11 and other apertures of the sleeve 10, not shown in the drawing, so that the filterable liquid can now flow directly from the annular space 15 through the bypass apertures into the filter chamber 13, as shown by the arrow 22 in Fig. 3.

WHAT WE CLAIM IS:—

1. A filter, more especially an oil filter for an hydraulic installation, including: a cup-shaped housing; an annular filter element contained within the housing; a cylindrical sleeve mounted on the end of the filter element adjacent the open end of the housing and projecting axially towards the open end; an elastically deformable annular valve member of V-shaped cross-section whose shanks provide a pair of annular lip seals, the interior surface of the apex of the V seating on the projecting end of the cylindrical sleeve; and an annular cover sealed to the open end of the housing and having a central filtrate outlet opening and a ring groove receiving the apex of the V-section of the valve member; wherein the cover is provided with openings for the inlet of liquid to be filtered into an annular space between the filter element and the housing wall, the said sleeve is provided with at least one bypass opening affording communication between the inlet and outlet openings of the filter for bypassing the filter element; and wherein the apex of the V-section of the valve member is clamped between the said cylindrical sleeve and the ring groove, and the shanks of the valve member are urged by their elastic stress to press against the cover and the cylindrical sleeve, respectively, to close the inlet and bypass openings, the closing pressure exerted by the shank against the cylindrical sleeve being greater than that exerted by the other shank against the cover.

2. A filter as claimed in claim 1 wherein the filter element is closed and sealed at its ends by respective end rings and the said cylindrical sleeve is formed as an integral projection from the inner edge of one of the end rings.

3. A filter as claimed in claim 1 or 2, wherein the said cover has a frustoconical portion terminating at its smaller diameter in an inwardly turned cylindrical skirt portion coaxial with the frustoconical portion, the said ring groove being provided by the junction between the two portions, the said inlet openings being in the frustoconical portion.

4. A filter substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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1390003 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

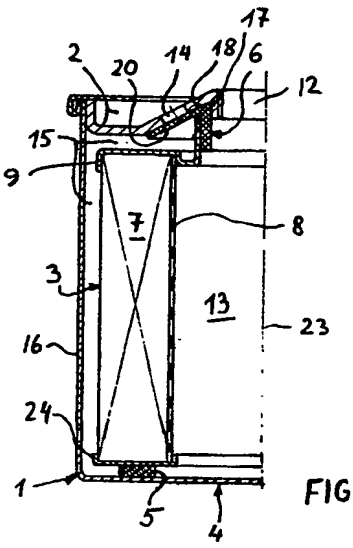

FIG.1

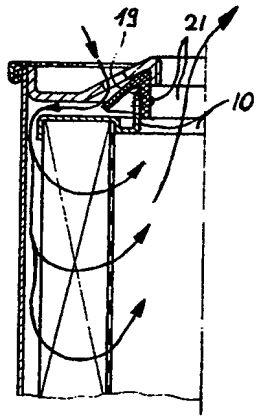

FIG.2

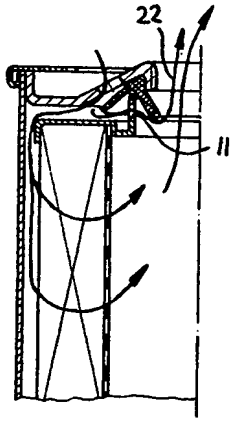

FIG.3